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Identifying Leadership Skills Required in the Digital Age

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CESifo *Working Paper No. 8180*

Identifying Leadership Skills Required in the Digital Age

Abstract

How should executives lead organisations and their employees in an increasingly digitalized business environment and what skills are needed to succeed? Although the evolution of digital technologies considerably changes working environments in organisations and creates new challenges for executives, only little research has been conducted on how these challenges and technology-driven changes are associated with requirements for the skill set needed by executives. In this paper, we bridge that gap by applying a three-stage research design. First, we develop a conceptual framework in which we categorise leadership skills included in the existing literature and associate them with tasks, management level, and leadership experience. To identify skills that are particularly relevant in the context of digitalisation, we conduct semi-structured interviews with executives and systematically investigate job advertisements for management positions. By triangulating the findings, we contribute new insights to the leadership literature and derive practical implications.

JEL-Codes: M120, M150, M510, M540, O320, O330.

Keywords: conceptual framework, digitalization, explorative study, leadership skills.

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1 Introduction

As digitalisation increasingly affects almost every business activity in today's organisations (El Sawy, Kraemmergaard, Amsinck, & Vinther, 2016), the question arises of whether and how this development influences the way executives lead and interact with their employees. In the last decade there has been a sharp increase in new theories and explanatory approaches in the leadership literature (Dinh, Lord, Gardner, Meuser, Liden, & Hu, 2014), with contributions ranging from meta-level considerations about leadership as such (Avolio, Reichard, Hannah, & Walumbwa, & Chan, 2009; Ferràs-Hernández, 2018; Kuratko & Hornsby, 1998) to in-depth analyses into specific effects of digital tools and electronic media in organisations (Hambley, O´Neill, & Kline, 2007; Townsend DeMarie, & Hendrickson 1998; Raghuram, Hill, Gibbs, & Maruping, 2019). Of the studies that have started to look at digitalisation, authors state, for example, that the increasing use of new technologies in organisations influences the required competencies, interpersonal expectations, and self-awareness of the workforce, as well as the way that work is carried out and structured (Colbert, Yee, & George, 2016). Furthermore, digital developments enable new ways of communicating and interacting with each other (Phelps, 2014) and create new career opportunities, while, on the other hand, they also considerably shift traditional activities or even make them obsolete (Hunt, 2015). Avolio and Kahai (2003) attribute the differences between traditional leadership and leadership in the digital age particularly to a changing work environment, whereas the fundamentals of leadership do not seem to change significantly (Hunt, 2015). In line with this, Kane, Phillips, Copulsky, and Adrus (2019, p. 34) state that "*many core leadership skills remain the same, [whereas] the particular demands of digital disruption call for certain new skills as well*."

So far, however, not much is known about what leadership skills executives need to cope with digitalisation-related challenges (Bankewitz, Aberg, & Teuchert, 2016). This is where the present study comes in and contributes to the literature in two ways: First, we develop a conceptual framework that systematises skills discussed in the existing literature based on several dimensions, thereby also considering personal traits. Second, we conduct semi-structured interviews with executives to identify skills which they perceive particularly important for mastering digitalisation-related challenges. An explorative research design with interviews allows new and unexpected aspects to be captured, which may turn out to be relevant extensions of previous knowledge.

Alvesson and Sveningsson (2003) state that even mundane aspects such as informal conversations should be considered, as they may prove to be increasingly relevant management competencies. Finally, we systematically analyse job advertisements for leadership positions to investigate which skills organisations currently expect from applicants. By triangulating the findings from the existing literature, from interviews with executives, and from our analysis of job advertisements, we have a sound basis for offering new insights into the relevant skills and traits leaders must have in the digital age.

2 Literature Review and Conceptual Framework

Technological developments such as machine learning and robotics in conjunction with the increasing automation of routine tasks lead to difficulties for both employees and executives (Gratton, 2016; Tarafdar, 2016). For executives, questions arise regarding how to manage virtual teams, how to handle multigenerational groups with different technology preferences, how to support functional knowledge transfer (Gratton, 2016), and how to create a mindful relationship with ubiquitous digital technologies (Tarafdar, 2016).

In a virtual work environment, face-to-face communication and other traditional social mechanisms no longer prevail, making it necessary to use new ways of coordinating teamwork and communicating (Townsend et al., 1998). This does not mean that digital technology is only relevant when team members are working from different locations. Rather, the virtual nature of teams is characterised by the extent to which digital tools are used for coordination, the resulting informational value, and how synchronised team members' interactions are (Kirkman & Mathieu, 2005). In this context, the primary challenge is not technological complexity, but the even greater complexity and flexibility of humans (DeRosa, Hantula, Kock, & D´Arcy, 2004). One question in this context is to what extent trust can be built without face-to-face contact and which factors influence trust in virtual teams (Breuer et al., 2020). Furthermore, a study conducted by Barley, Mayerson, and Grodal (2011) shows that inappropriate management of technologically mediated communication leads to interruptions in employees' working processes and increases their perceived stress levels. Similar responses were found by Colbert et al. (2016), who identified that continuously checking one's e-mails at work and at home are "[…] *ingrained habits for many people* […]" (Colbert et al., 2016, p. 736). Accordingly, employees spend much of their time answering e-mails, which can lead to the perception of being overloaded. Interestingly, the more

time employees spend dealing with their e-mails, "[…] *the greater their perceived ability to cope*" with the overload (Barley et al., 2011, p. 887). Another study by Sykes (2011) confirms that e-mails have become a significant cause of interruption during the workday.

While the Internet, e-mail and in some cases even social media have become standard tools for doing work, "[…] *they also provide easy access to family, friends, online-shopping and other nonwork purposes while at work*" (Colbert et al., 2016, p. 734). Being electronically connected (to work) at all times makes it challenging to create a clear-cut separation between work and leisure, which in turn can promote work-nonwork conflicts (Butts, Becker, & Boswell, 2015). If managers are not able to find appropriate ways to establish boundaries between work and leisure time, organisations might face the fallout of information overload, technology addiction, and techno-stress (Tarafdar, 2016).

Another potential for conflict arises from the age structure of the workforce. In many cases, younger employees are more familiar with digital technologies than their older colleagues. If older employees work with younger co-workers in a team, these groups' different technology knowledge and preferences can lead to conflicts (Colbert et al., 2016). Managers should be able to identify such a divergence at an early stage and avoid escalation.

Finally, the issue of cyber-security needs to be considered. Modern technologies can bring about significant improvements through information capturing and processing, but they also make organisations more vulnerable to cyber-attacks (Lynch & Gomaa, 2003). Executives need to be aware of the respective benefits and risks to ensure adequate use.

Some of the changes that are needed to address today's organisational challenges may be in the design of the technology itself (Colbert et al., 2016), while others may require rethinking leadership-related topics. The potential that could arise from the appropriate use of digital technology and the role that leadership plays in this context will be outlined in the next two subsections.

2.1 Technology-Driven Leadership Potential

Even though digital technology is ubiquitous in modern work environments, its potential is often used insufficiently (Colbert et al., 2016). Even entry-level employees can bring high levels of digital know-how into organisations (Colbert et al., 2016), which can be valuable and thus should

be exploited. Employees have access to a wealth of information that can be used to create multifaceted services at reduced costs (Colbert et al., 2016), with digital technology enabling collaboration among geographically distributed team members (Phelps, 2014). On a virtual level, an optimal composition of teams can be reached without resulting in clashes within the existing organisational structure (Townsend et al., 1998). Among the tools enabling virtually based forms of work and collaboration are web-based customer relationship management systems, web-based collaboration tools, and project- or content-management systems, all ranging from simple applications to sophisticated suites of tools (Phelps, 2014). Digital tools may also enable employees to track and evaluate their working processes, making it easier for them to identify productivity issues (Gratton, 2016).

Overall, managing digital technologies efficiently can bring about many benefits. With the phrase "*Anyone can be as digitally sophisticated as they choose to be*", Hunt (2015, p. 50) points out that both managers' and employees' attitudes are essential for making the best possible use of modern technology.

2.2 Role of Leadership in the Digital Age

As technological innovations need to be implemented appropriately, leaders seem to be critical to "[…] *laying the foundation for and facilitating digital transformation*" (Hunt, 2015, p. 51). To be able to do this, leaders need to be aware that social and digital technologies change the nature of work, and they need to adapt their way of working accordingly (Hunt, 2015). Furthermore, leaders need to serve as role models, promote and perpetuate cultural values that encourage a supportive attitude towards change, implement appropriate governance and organisational structures, and ensure employees have profound digital know-how (Day, Fleenor, Atwater, Sturm, & McKee, 2014). Executives also need to remove obstacles to the use of new technologies and provide opportunities for employees to work with them (Bondarouk & Ruël, 2008).

Furthermore, executives should be the ones to discover ways of supporting a shift towards flexibility, the flow-driven use of digital tools, and a mindful relationship with digital technologies (Tarafdar, 2016). Gratton (2016) found that many people use digital technologies more often in their everyday life compared to at work, and, accordingly, they associate positive technology-related influences with their daily lives rather than with their work (Gratton, 2016). Therefore, executives should take on the task of encouraging employees to establish mindful usage patterns

for new technologies, considering the potential work-nonwork conflicts that may arise if employees feel permanently attached to work. According to Colbert et al. (2016), such mindful usage patterns are characterised by "[…] *time for focused thinking, opportunities for recovery, and effective collaboration*" (Colbert et al., 2016, p. 735).

To exploit the potential of virtual teamwork, executives should also be able to leverage virtual collaboration tools like Yammer or Slack for communication, Google Drive for collaborative writing and Trello for collaborative project management (Colbert et al., 2016). In this context, leaders should not only focus on their own preferences but also take into account the different preferences of individuals on their teams (Tarafdar, 2016). Further, because virtual teams might feel less connected to their organisation, leaders must define and communicate the team's role within the greater mission of the organisation (Townsend et al., 1998). If employees can identify with their organisations, this can both increase intrinsic motivation and promote a sense of connectedness within the team and with the organisation. Furthermore, leaders need to clarify their expectations about employee performance and develop novel mechanisms to supervise and control geographically dispersed team members (Townsend et al., 1998).

3 Conceptual Framework

There is a wide range of literature that discusses various leader attributes such as personality, skills, traits, motives, and values (see Zaccaro, Green, Dubrow, and Kolze (2018) for a comprehensive review).

To develop our leadership skill framework, we first look at core leadership activities and analyse what skills and traits a leader would need to execute these activities. According to Friedman, Fleishman, and Fletcher (1992), the three core activities of leadership are personnel supervision, project management, and strategic planning[1]. Furthermore, Katz (1974) defines three basic skill categories to be crucial for successful leadership: technical skills, human skills, and conceptual skills. To develop our framework, we first compare and combine the core leadership activities and the basic leadership skills (see Figure 1).

[1] Other categorisations of leadership activities exist, see for example (Yukl, 2012).

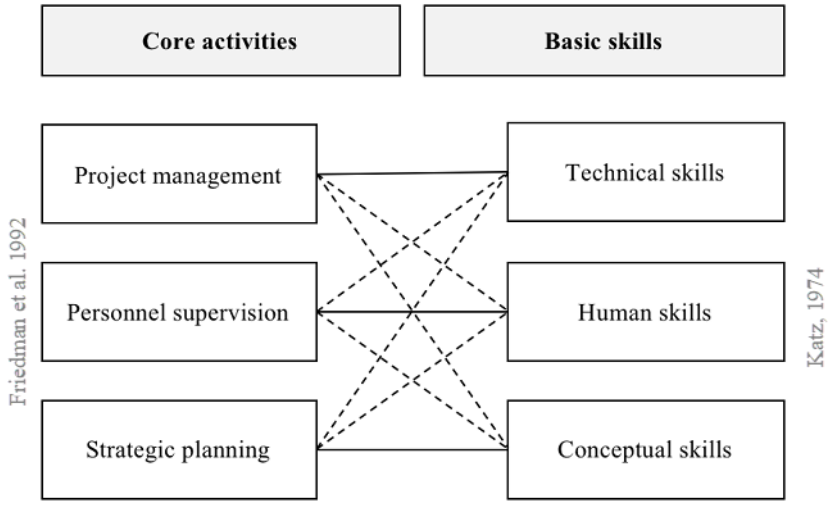

Figure 1: Connection between Core Leadership Activities and Basic Leadership Skills

Comparing the core activities and basic skills, we identify a noticeable connection between them. In Figure 1, we use bold lines to indicate a strong relationship between elements and dashed lines to denote a comparatively weaker connection. The underlying consideration is that specific core activities require certain basic skills to be particularly strong. For example, strategic planning will most likely require highly developed conceptual skills, as leaders must take into account a wide variety of information. Nevertheless, in many cases strategic planning also requires adequate interaction with employees (human skills) and sound knowledge of different techniques (technical skills), albeit not to such a high degree.

In the existing literature on leadership skills, a clear differentiation between skills and traits is often missing. Zaccaro, Dubrow, and Kolze (2004, p. 104) define "[…] *leader traits as relatively stable and coherent integrations of personal characteristics that foster a consistent pattern of leadership performance across a variety of group and organizational situations*". This ambiguity led us to demarcate these constructs and to review whether certain leader attributes declared as skills are more likely to be traits. Following Lord and Hall (2005), we distinguish traits and skills by understanding traits as stable constructs and skills as abilities which need to be developed. Accordingly, we introduce the concept of trait into our framework and partition traits from skills to emphasise the difference between the two concepts. Personal traits describe attributes that people have or bring with them and that cannot be learned from scratch, while skills can be learned or improved. However, developing leadership skills usually goes beyond training one's behavioral styles, as it requires a combination of cognitive, social and behavioural abilities (Lord & Hall,

2005). Individuals' motivation to learn and their interest in leadership are important prerequisites for the development of leadership skills (Chan & Drasgow, 2001).

Different approaches for structuring skills are proposed in the literature. For example, Mumford, Campion, and Morgeson (2007) suggest subdividing skills into personal skills, business skills, and strategic skills, whereas Chan and Drasgow (2001) recommend distinguishing between cognitive, social, and behavioural skills. Another relevant aspect is the level of effort required to improve a skill. For example, skills can be separated into surface structure skills and deep level skills (Lord & Hall, 2005), where surface structure skills do not need much effort and time to be developed, but deep level skills are more complex and require more time and effort to improve (Lord & Hall, 2005). However, surface skills are relevant since they can be taught in training sessions over only a few days and can help novice leaders make better decisions at the beginning of their careers (Lord & Hall, 2005). When comparing surface and deep level skills, it appears that deep level skills are less self-centred. This means that the development of surface skills takes place at the individual level, whereas the development of deep level skills requires knowledge and principles for developing other peoples' skills (Lord & Hall, 2005). This is in line with Hunt (2015), who states, for example, that leaders not only have to become digitally literate themselves but should likewise ensure that their employees become digitally literate as well. Furthermore, the distinction proposed by Pulley and Sessa (2001) in individual skills (e.g., storytelling and perspective taking) and team-based skills (e.g., dialogue and managing networks) confirms the relevance of distinguishing between the individual-focused skills and those related to a less self-centered perspective.

Individuals, including leaders, often adopt provisional identities when trying out new roles to discover what kind of behaviour leads to success, and this process requires individuals to have role models who demonstrate new behaviour and provide feedback (Ibarra, 1999). This has become an even more critical consideration now, because it is less common for teams in modern organisations to be co-located. Guillén, Mayo, and Korotov (2015) investigated whether an individual's motivation to lead is influenced by comparing herself/himself to exemplary and prototype leaders. They found that self-comparison to both exemplary and prototype leaders is positively related to the motivation to lead, confirming that self-to-other comparisons play a vital role in developing skills. Furthermore, Miscenko, Guenter, and Day (2017) identify leadership skills to be associated with changes in leader identity over time. Lord and Hall (2005) take up the idea of self-to other

comparison and consider the relevance of temporal changes. Accordingly, they differentiate between novice leaders, intermediate leaders, and expert leaders, where novice leaders tend to have a more individual-focused perspective than intermediate and expert leaders.

Additionally, Mumford et al. (2007) suggest considering the management level as a further dimension; they suggest that leaders at higher management levels "*require higher levels of all leadership skills*" (Mumford et al., 2007, p. 154). They additionally identify specific strategic skill requirements to be crucial at high-level positions (Mumford et al., 2007). Contributions from Hambrick (1981), Katz (1974), Kraut, Pedigo, McKenna, and Dunnette (1989), Porter and Ghiselli (1957), Raes, Heijltjes, Glunk, and Roe (2011), and Wooldridge and Floyd (1990) suggest that strategic planning is one of the core tasks of top management executives. Although strategic planning is also part of the middle management's responsibilities, lower levels of management seem to be more closely linked to tasks such as personnel supervision (Hales, 2005; Kraut et al., 1989) and project management (Hales, 2005; Porter & Ghiselli, 1957; Staehle & Schirmer, 1992; Wooldridge, Schmid, & Floyd, 2008). However, differentiating between middle management and lower management is challenging, since the boundaries are floating (Porter & Ghiselli, 1957). Considering that different core tasks depend on the management level and that different skills are needed to perform the respective tasks successfully, we conclude that executives need to adapt their skill set when switching to another management level.

In Table A.1 in the Appendix, we provide an overview of leadership skills and traits considered in the existing literature[2]. We thereby distinguish leadership skills and traits that were addressed in general from those that were mentioned with a reference to digitalisation. Among the digitalisation-related leadership skills are aspects such as becoming digitally mindful, partnering with digital colleagues, digital literacy, as well as technology-related skills. Furthermore, particularly interesting in the context of digitalisation are communication skills, flexibility, and adaptability.

To further systematise the leadership skills and traits listed in Table A.1, we develop the conceptual framework depicted in Figure 2. This framework is based on two management levels (middle management and top management), the core leadership activities suggested by Friedman et al. (1992), the basic leadership skills proposed by (Katz, 1974), and the subdivision recommended by

[2] Existing research also offers considerable reviews of skills (and traits), that have been identified as important in the literature, e.g. Bennett (2002) and Judge et al. (2002).

Lord and Hall (2005). We supplement the levels from Lord and Hall with leadership experience, suggesting a relationship between increasing experience and ascending leadership levels. Alongside the skills mentioned by Katz (1974), we add individual traits as a further dimension.

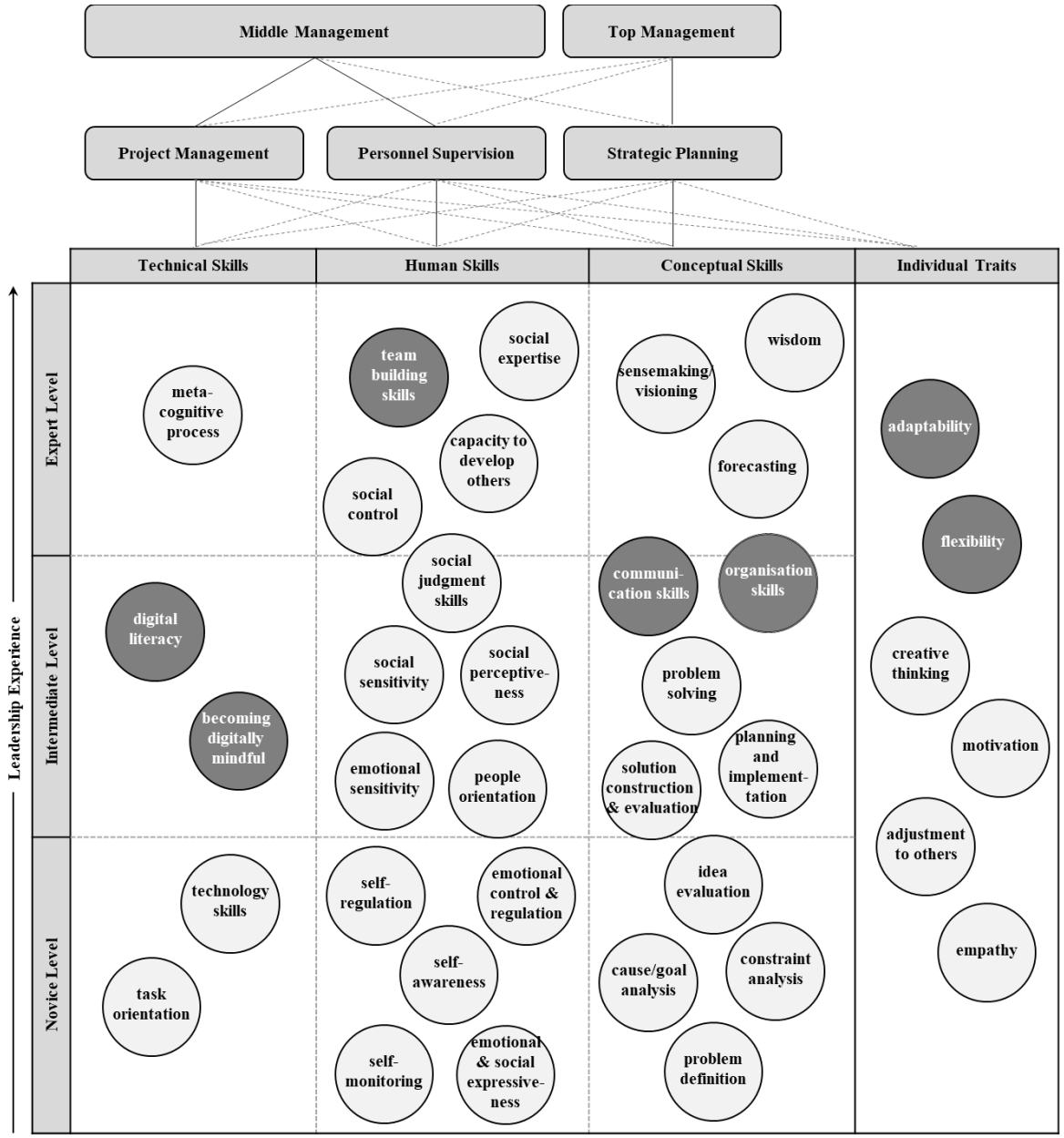

Figure 2: Leadership Skill Framework

The first two levels of the framework link the top management and middle management to core leadership activities. As discussed above and depicted in Figure 1, the second and third level of the framework link the core leadership activities to three basic leadership skills. In addition to the three basic leadership skills, we include in a fourth column the individual traits that are also needed for

executing core activities. Another dimension is the leadership level proposed by Lord and Hall (2005), which can be novice, intermediate, and expert. These leadership levels are not necessarily equivalent to the management levels, as a direct or quick career entry into a top management position is possible even when a manager lacks experience, making them a novice-level manager in a top management position. The idea is that novice leaders are more focused on themselves compared to expert leaders. Thus, when it comes to human skills, novice leaders are primarily concerned with training their leadership behaviour (confident appearance, adequate communication, etc.), while intermediate and expert leaders are more externally oriented and consider social dynamics.

Expert leaders' human skills go even further and are focused on influencing and controlling the behaviour of employees and social dynamics. We take this context into account by supplementing leadership levels with leadership experience. This is depicted on the left side of Figure 2. Leadership level and basic skills span a matrix in which leadership skills and traits are placed. Within the individual skills and traits, we distinguish those skills and traits linked directly to digitalisation by marking them dark grey.

When inspecting those leadership skills and traits associated with digitalisation, it appears that soft skills are particularly relevant. This is in line with the results of a study conducted by Marques (2013), in which soft skills are found to be increasingly relevant for executives. Similarly, Borghans, Weel, and Weinberg (2014) found that people skills are particularly important. Hard skills, which are typically measurable, enable persons to perform a task properly on their own or with the help of technical devices, whereas soft skills are needed in interpersonal transactions and, therefore, allow for successful interaction (Laker & Powell, 2011; Robles, 2012). However, the majority of leadership skills have not yet been examined in the context of technological change. For this reason, we present this framework as a conceptual basis and use interviews as well as an analysis of job advertisements[3] to generate insights into what is particularly required today.

[3] There is some research linking job advertisements with leadership skills, such as the study by Den Hartog, Caley, and Dewe (2007) which examined the frequency of occurrence of leadership words and phrases in 1390 advertisements for leadership positions and compared them to the skills and traits included in certain leadership theories. They identified leadership skills, communication skills, interpersonal skills, influencing skills, motivational skills and management skills as the most frequently mentioned skills, 'people oriented' and 'transformational' as the predominantly used attributes, as well as a strong link between the mentioned phrases and the presented leadership theories (Den Hartog et al., 2007). Bennett (2002) made in his analysis of job advertisements and the consecutive survey-study "an attempt to obtain an objective assessment of the transferable personal skills demanded of graduate

4 Methodology and Data

The method of this paper comprises a three-stage process. In the first stage (described in the previous section), we developed a conceptual framework to systematise leadership skills anchored in the existing literature, thereby distinguishing between skills and traits. In the second stage, we conducted semi-structured interviews with middle and top management executives to generate insights into current leadership challenges as well as skills and traits perceived as particularly relevant in the context of digitalisation. In the third stage, we applied a systematic Internet search to collect data on job advertisements for management positions and to analyse what skills managers are expected to have. By taking into account the skills and traits included in job advertisements, we gain an additional perspective that enables us to compare company expectations with the interview data. The structure of this chapter follows this process and describes stages two and three. We first present the interviews, then the job advertisement analysis.

4.1 Semi-Structured Interviews

We follow (Eisenhardt, 1989) and use semi-structured, exploratory interviews with open-ended questions. A crucial advantage of qualitative interviews over standardised surveys is their higher degree of sensitivity to context (Trinczek, 2009). Interview situations are dynamic and can develop a life of their own (Trinczek, 2009), which can be associated with a high and versatile gain of information. Open questions thus allow the collection of a variety of potentially relevant and otherwise neglected information. At least 12 interviews were set as the target sample, as this number is sufficient to reach saturation (Guest, Bunce, & Johnson, 2006).

The interviews were conducted from May 2018 to September 2018 and followed a standardised interview guideline. We audio-recorded, transcribed and coded all interviews. Transcribing was done using the software 4transcript and coding with MAXQDA. The Gioia method (Gioia, Corley, & Hamilton, 2012) was applied for data analysis, as it allows for a systematisation of many statements into fewer overarching dimensions. Saturation in our coding framework (Guest et al., 2006) was achieved when the repeated analysis did not reveal any new codes for stimulating

job applicants" (Bennett, 2002, p. 457). Similar to our research design, the first research stage identified the 14 most frequently mentioned skills in 1000 job advertisements and linked them to the four occupational categories of marketing, general management, finance and human resource management. In the second research stage, managers were asked to rank the identified skills as most to least important and indicate skills today's graduates are best/worst at. The most important skills were found to be communication, teamwork, IT and organisation, while the least important were foreign languages, self-confidence, initiative and numerical skills (Bennett, 2002).

exploration or exploitation, nor did it add additional details on existing codes (Havermans, Den Hartog, Keegan, & Uhl-Bien M., 2015). To ensure the comparability of the interview results, the sample was limited to executives from industrial companies located in Northern Germany. To be able to identify differences between management levels, representatives of top management and middle management were interviewed. All interviewees were informed that the results would be evaluated anonymously to avoid biased statements. In total, 23 executives from 21 companies participated in an interview, of which two did not agree to an audio recording. To ensure a consistent analysis, we only considered the remaining 21 interviewees from 19 companies in our investigation. Of the 21 interviewees, nine work in top management and twelve in middle management positions (see Table 1).

ID	Position	Management Level	Length in Mins
1	HR Manager	Middle Management	51
2	Commercial Manager	Top Management	60
3	Corporate Strategy and Digital Transformation Manager	Middle Management	55
4	Managing Partner	Top Management	66
5	Commercial Manager	Top Management	48
6	Managing Partner (Commercial Responsibility)	Top Management	55
7	Manager Technic, Procurement, Production	Top Management	47
8	HR Manager	Middle Management	68
9	Commercial Manager	Top Management	61
10	Manager and Owner	Top Management	55
11	HR Manager	Middle Management	41
12	Manager and Shareholder	Top Management	55
13	Representative Department Chief	Middle Management	59
14	Service Manager	Middle Management	50
15	HR Manager	Middle Management	68
16	HR Manager	Middle Management	63
17	Director HR	Middle Management	56
18	Strategic Training Manager	Middle Management	48
19	Chief Executive Officer	Top Management	68
20	Head of Development and Talent Management	Middle Management	55
21	Procurement Manager	Middle Management	60

Table 1: List of Interviewees

4.2 Job Advertisement Analysis

In parallel to the interviews, we collected job advertisements for leadership positions using StepStone and Xing. As with the interviews, job advertisements were limited to industrial companies located in Northern Germany[4]. The data was extracted from StepStone on May 5, 2018, and from Xing on May 10, 2018. MAXQDA was used to analyse the data according to the Gioia

[4] To cover the region in the search, the cities Oldenburg, Osnabrück, and Herford were chosen as reference cities with a 100-kilometre radius around the cities.

method. Our initial sample comprised 377 job advertisements. Excluding duplications led to a final sample of 278 advertisements, of which 11 are related to top management, 126 to middle management, and 150 to lower management positions. Most of the job advertisements are structured similarly and can be subdivided into qualification, experience, knowledge, and other requirements. To create a preliminary coding scheme, we encoded the first 10 % of the job advertisements according to the Gioia method. We derived 113 first-order concepts and 41 second-order themes. Based on this preliminary coding scheme, we developed a coding guide to ensure a consistent coding procedure. The coding guide includes, for example, the possibility of multiple encodings and integration of new categories, descriptions of the codes, and anchor examples. We generated a total of 3821 codes, of which only four could not be assigned to any of the 41 themes, suggesting a good fit of the coding scheme. In the next step, in line with the Gioia method, the 2nd-order themes were compressed into 3rd-order dimensions. At this point, we assigned the 41 themes to the dimensions *qualification*, *experience*, *knowledge*, and *other requirements*, and sorted them according to the frequency (see Figure 3).

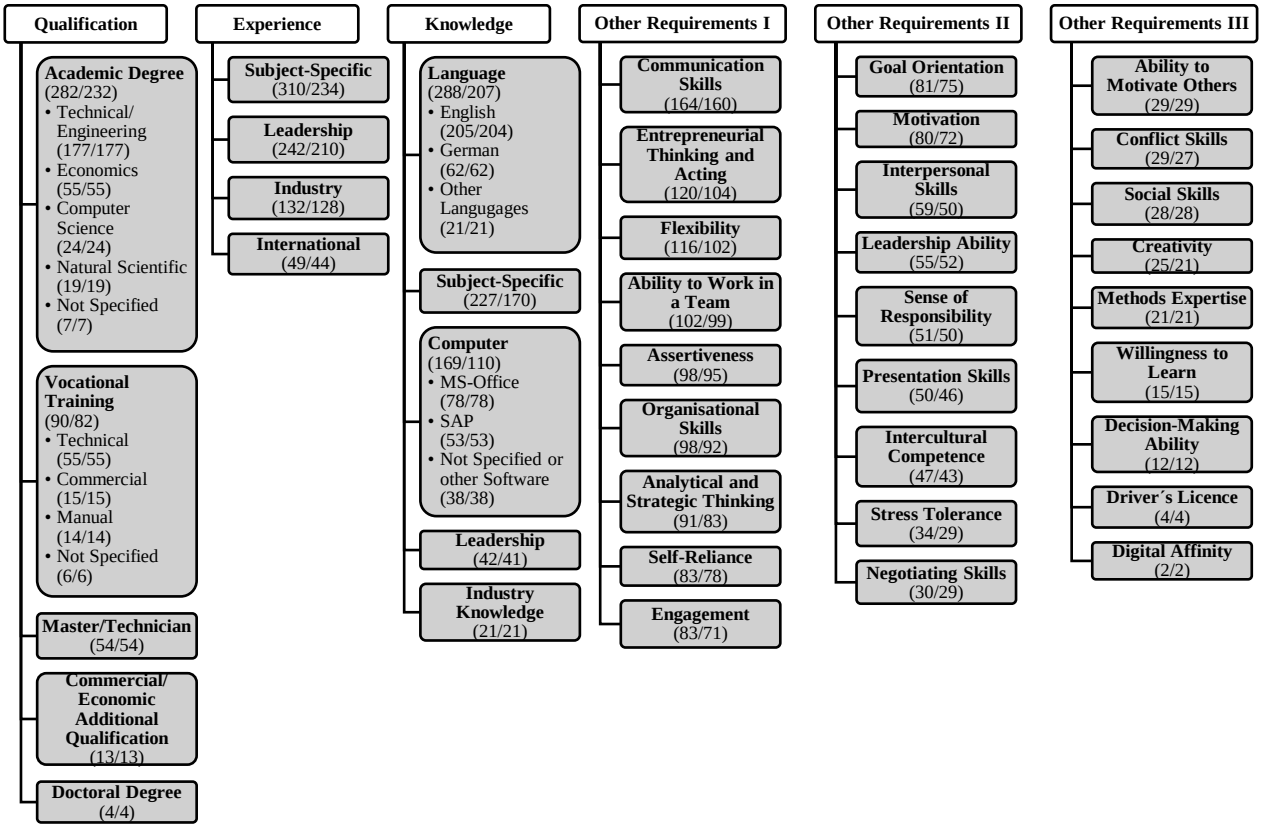

Figure 3: Leadership Skill Requirements Identified in Job Advertisements

The first number in parentheses shows the frequency with which a theme was named, and the second shows the number of job advertisements in which they were included. These numbers can be different, as selected themes may contain several aspects that are mentioned individually within one job advertisement. An example for this is subject-specific experience, which has 310 codes but is included in only 234 job advertisements. Since we interpret the frequency of naming as an indicator of relevance, a nuanced consideration of these numbers is crucial to avoid biases in the interpretation of the results.

5 Results

In this section we present our results. We first present the results from the interviews, followed by the results derived from the analysis of the job advertisements.

5.1 Interview Results

5.1.1 Core Leadership Activities

We use the structure of our framework and assign core leadership activities to the categories project management, personnel supervision, and strategic planning. For each category, we take into account the four aspects most frequently named by the interviewees (see Figure 4).

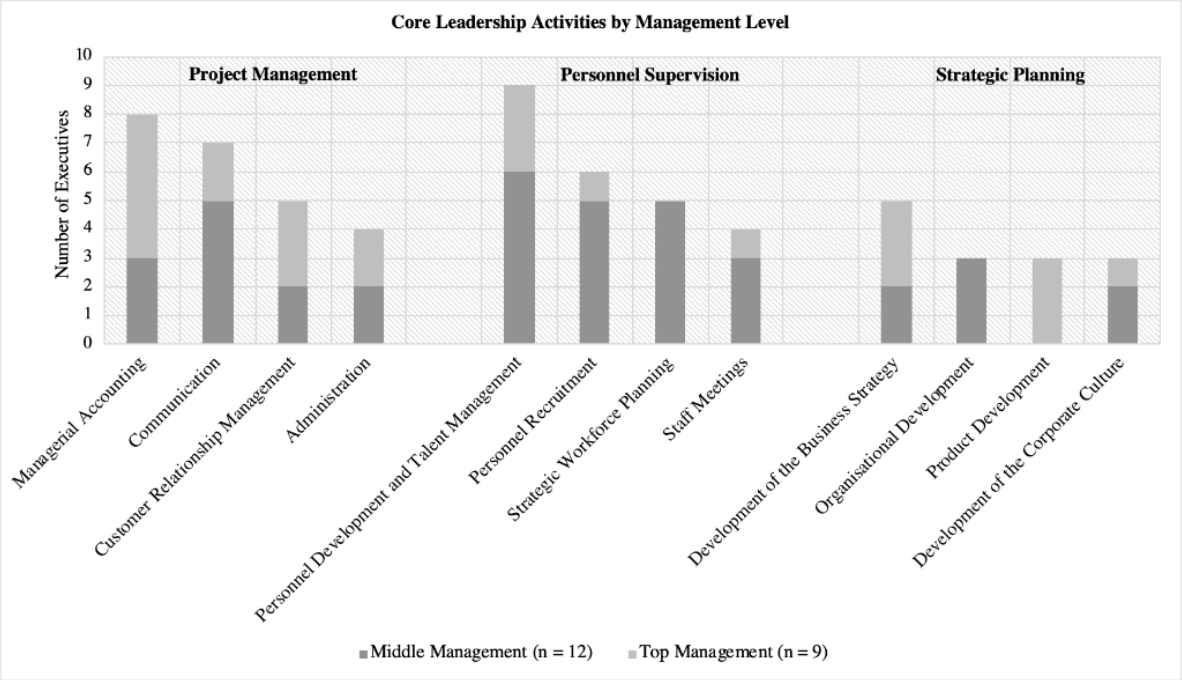

Figure 4: Core Leadership Activities by Management Level

Our results show that both middle management and top management executives take on tasks from all three categories, with only minor differences between management levels. Accordingly, strategic workforce planning and organisational development seem to be particularly middle management tasks, while product development is associated more with executives in top management positions. Interestingly, tasks in the category of strategic planning are somewhat underrepresented compared to the tasks in project management and personnel supervision, indicating that executives spend a large amount of their time on operational tasks. Five middle management executives explicitly stated that strategic issues often fall behind because of a multitude of operational tasks. However, around 24 % of the interview participants indicated that they see a trend towards strategic tasks gaining priority.

5.1.2 Challenges on a Corporate and Personal Level

We asked the participants to identify challenges at the corporate level and challenges they personally perceive at their position within the company. At the corporate level, interview participants identified the three most significant challenges as being (in descending order) personnel acquisition, digitalisation, and pressure for innovation. In this regard, digitalisation is perceived both as a source of pressure for change and a potential for new digital business models. *"On the one hand, it is about digitising oneself as an organisation. But then it is also about digitising towards the customer. So how do we actually map the customer interface?" (I13).* As competitors also recognise these new opportunities, interviewees reported an increasing pressure for innovation, going hand in hand with *"always having to be ahead of the competition with innovations" (I17).* However, being ahead of the competition also means breaking new ground, which can entail far-reaching changes and corresponding risks. *"Not so long ago, we invested a considerable amount of money in a new technology that is not yet being used by the competition. And this has turned our organisation upside down, because this new technology actually allows new business models, including digital business models" (I5).* Yet, lack of experience makes it difficult to determine which technology to invest in. *"You can pump in a lot of money, but that is the question, where do you start? What do you really have to do to find the right degree of digitalisation?" (I4).*

Our results confirm that digitalisation is finding its way into virtually all areas of organisations, but predominantly affecting production and technique, sales and service, and human resources. *"The*

entire network is becoming more and more complex. The individual department, but also the processes" (I7). With regard to production, the interviewed managers indicated that digitisation is being incorporated in automation, networking of machines and individualisation, whereby complex processes have to be handled. Sales and service are particularly concerned with the development and implementation of digital customer interfaces, whereby one challenge is that customers themselves have a different affinity for digitalisation. *"It can be problematic to be more digital than the customer" (I6).* In addition, managers frequently report on digitalisation-related challenges in the area of human resource management. *"Digitalisation plays an important role, especially in connection with the demographic change or, in general, with the naturalness with which employees use mobile devices today" (I21)*. One challenge in this context is to take into account employees' different levels of familiarity with digital technologies and to enable effective collaboration.

Regarding the challenges on a personal level, the topic of information diversity heads the list: "*Personally, I sometimes get annoyed by the flood of information that comes in every day and sometimes with things that make me wonder, 'do I have to know that?' or 'what shall I do with it now?'" (I15).* Closely related and also frequently named were the variety of themes on *"where one constantly has to think again and constantly has to find new ways" (I1).* Also among the most relevant digitalisation-related challenges on a personal level were rapid changes, a high workload, and communication difficulties.

Some executives reported that rapid developments and changes are causing uncertainty among employees. Concerns include *"how * can I cope with this time, with this change, with this fast-paced life? This is a challenge for the employees and also for me" (I16).* In interacting with employees, about 33 % of the interview participants said they find it challenging to motivate subordinates. In this context, it is about *"taking people with us when we do new things" (I12)* and about *"making the team work as a team" (I19)*, thus strengthening cohesion. Middle management executives report difficulties with remote leadership, which is necessary to organise locally distributed employees: *"I had to learn that and I still have to learn that today. Because of course, you are not on site, the staff is intangible and must use other media" (I18).* A remote supervisor *"tries to fix things via Skype and phone, even from another time zone. Of course, this often leads to not negligible distortions" (I1).* In the opinion of around 28 % of the executives interviewed, the

corresponding technological possibilities facilitate work, whereas according to 24 % of the interviewees, they also cause uncertainty among employees.

However, changes towards more digital means in communication are not limited to remote leadership, but they also manifest within organisations. Important questions are *"how do you communicate what, and what type of communication pathways do you use as a company?" (I2). "You can already see that there is a lot left on the track that cannot be transported along the way, something like nuances, but also a social style that gets lost somewhere when I communicate very much digitally" (I17).*

Another issue that was raised several times in the context of personal challenges was finding an adequate leadership style. Central to this theme were interviewees' comments that they prefer a cooperative leadership style and must promote their employees' personal responsibility and initiative. *"But also flexibility in the respective decisions, decision paths and in the implementation of measures" (I17)*, which is particularly relevant when employees work remotely and have to be managed decentrally.

5.1.3 Required Leadership Skills and Essential Traits.

Based on our framework, we differentiate leadership skills and individual traits and take a nuanced look at differences between top management and middle management. Our results show that the executives interviewed perceive the four most important leadership skills to be (in descending order) communication skills, subject-specific knowledge (especially IT knowledge), self-organisation skills, and self-reflection (see Figure 5). *"One essential thing is that you have to communicate on all levels. That means I have to be able to communicate with the factory employee, with the colleague from the warehouse but also with the board" (I16).* In this context, managers not only have to convey content, but they also must employ *"listening" (I12; I15)* and acting as a *"communication interface" (I5).* The ability to communicate effectively and efficiently is not a skill that has only become relevant in connection with an increased digitalisation. Managers have always had to be good communicators. Nevertheless, the fact that communication skills are emphasised in the context of digitalisation can be explained by the fact that the variety of communication channels has increased with modern technologies, which goes hand in hand with increased complexity of communication. Furthermore, a less authoritarian and more cooperative leadership style is associated with an increased exchange between managers and employees,

whereby not only the content but also the communication manner and channel are relevant. *"Today, I think much more needs to be argued and more things need to be considered. I believe that you have to face more discussion and accept much more from your employees in order to make decisions" (I16). "I need to be able to communicate well when I sit together with employees, I need to be able to communicate just as well via TeamViewer, via telephone, via video conferencing" (I11).* Even though communication is a complex and challenging task, Green (2012) found that communication skills increased quite swiftly over time.

Also in the case of subject-specific skills, an in-depth analysis is necessary to identify the digitalisation-related particularities. Frequently named aspects include IT knowledge, language skills (especially English), and technical know-how, indicating that it is crucial for executives to make adequate use of IT solutions, to be able to correspond with different countries, and to have profound knowledge of the company's business *"You must have an affinity for IT. This is a very important point. Of course, you have to understand the subject of IT. Many people are afraid of it. You do not have to be" (I9).* Remarkably, both soft skills (communication skills) and hard skills (subject-specific knowledge, self-organisation skills, and self-reflection) are at the top of the list, suggesting that both skill categories are highly relevant to deal with today's leadership challenges. In other words, soft skills cannot substitute or compensate for hard skills, even if more and more technical processes can be automated with the help of modern technologies. This is in line with Artz et al. (2016), who found that an executive´s technical competence is positively related to employee job satisfaction.

Middle management executives in particular named self-organisation skills as being important, indicating that much organisation has to be done by executives of this management level, while executives in top management positions may delegate organisational tasks. Particularly relevant aspects of self-organisation include the ability to prioritise, delegate, and structure tasks and allocate time efficiently. *"What I think is very important today is to prioritise. To say what has priority now. Which of the many topics that are dealt with must be done first" (I6).* Both middle management and top management executives consider self-reflection to be highly relevant today. *"Very important is the competence of self-reflection […] to hold up a mirror to oneself and to say: 'where are my own strengths and weaknesses?'" (I17).* This ability is closely related to self-awareness (see the framework in Figure 2), but goes beyond this by critically questioning one's

own position and actions. *"Self-reflection, that is, questioning oneself and what one is doing. I believe that this has gained in dominance, especially in the context of digitalisation, where you simply have to look at what potentials you still have. What can I do better with the help of digitalisation, and also questioning processes. That has become much stronger" (I21)*

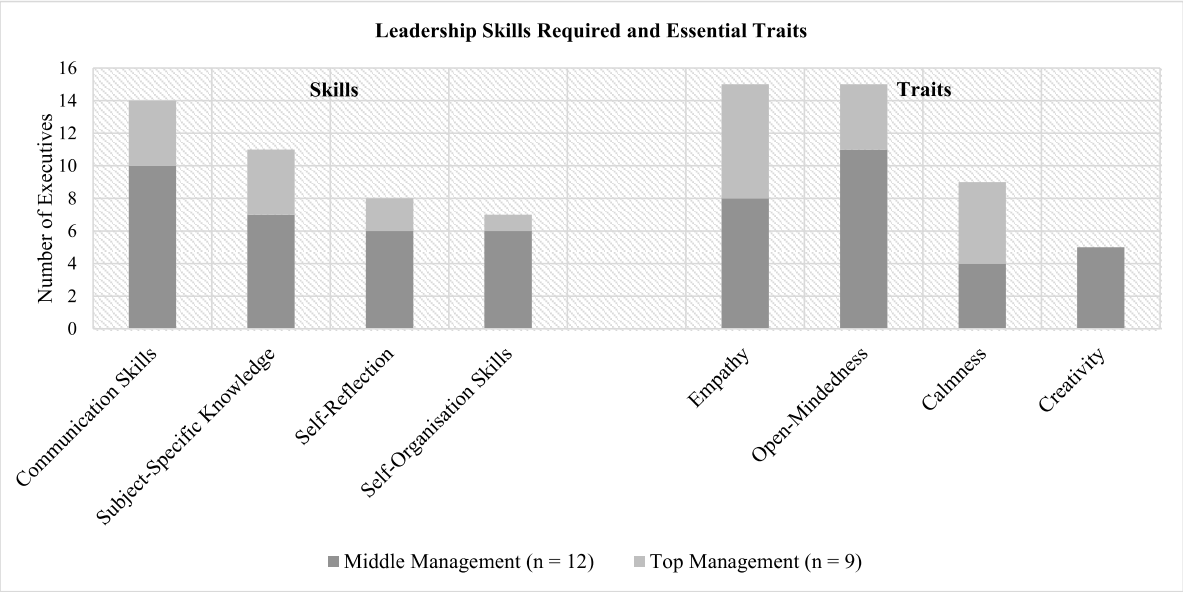

Figure 5: Leadership Skills Required and Essential Traits

In addition to the most relevant leadership skills shown in Figure 5, skills that are mentioned less frequently include (in descending order) analytical skills, decision-making skills, moderation skills, networking skills, abstraction skills and assertiveness. Networking skills and decision-making skills are particularly needed given the growing interconnectedness of corporate activities and the increasing diversity of information within which fast and forward-thinking decisions must be made.

With regard to individual traits, those of empathy, an open-mindedness towards the new, calmness, and creativity are considered crucial. Empathy is regarded as elementary, especially with regard to the near future: *"I believe that in the future we will need a generation of leaders who are very clear and aware of what the wishes and needs of employees are. I would classify that under the heading of empathy and as a trait" (I15).* An open-minded attitude towards the new is also seen as a relevant facilitator of change, which is not yet anchored in our framework: *"But open-mindedness may also be a trait rather than an ability […]. So the point is to really open up a new world of thinking with the possibilities and solutions at hand and to understand and initiate possibilities and make changes possible in order to be able to really break up the past" (I20). "I have to say quite clearly,*

then my open-mindedness and my age help me to simply say, yes well, I will take a look now and then we will see how it works" (I2). In this context, managers also mention curiosity, which is associated with open-mindedness. *"I think an essential trait might be curiosity, to say, to look again and again, how can I do things better and how can I personally develop myself" (I6).* Calmness is a trait that around 43 % of the executives perceive as being essential, which is, like open-mindedness, not well anchored in the existing literature on leadership skills. *"I think you definitely need a lot of calmness. It is very helpful if you do not have nervous approaches that do not benefit anyone" (I4). "It means to keep calm, not to oversleep, but to do the whole thing step by step in order to not get bogged down" (I2).* It is therefore a matter of developing the necessary dynamism and still acting prudently and weighing options. *"Just listen more now, let more other thoughts work. Sometimes to be slower to become more effective, to let things work for the time being" (I6).* In line with our framework, creativity is considered to be one of the most important traits, being required particularly in middle management. In addition, humanity, self-confidence, willingness to change, initiative, courage, and trust were repeatedly stated to be relevant traits. *"Willingness to change is very important. This means the ability to get involved in change on the one hand, but also to find the right means to successfully shape change for oneself and one's employees" (I6). "The point right now is to leave the track and make a big step, so to speak, and to make that possible. That is precisely what is new. Being able to let go" (I20).*

5.2 Results of the Job Advertisement Analysis

The analysis of job advertisements revealed that in the companies under consideration, the aspects particularly expected for leadership positions include an academic degree (technical or engineering), selected experiences (especially subject-specific, leadership, industry), knowledge in languages (especially English), and knowledge in subject-specific topics as well as computer programs (most often MS-Office and SAP). Furthermore, aspects such as communication skills, entrepreneurial thinking and acting, and flexibility are frequently included within the category of other requirements. Although speaking English is often assumed, requirements for international experience are only named in a few job advertisements (15.8 %). Interestingly, aspects such as digital affinity, decision-making ability, willingness to learn, and creativity are included in less than 10 % of the job advertisements analysed.

Only minor differences can be identified in the top ten skill requirements between the different management levels (see Figure 6).

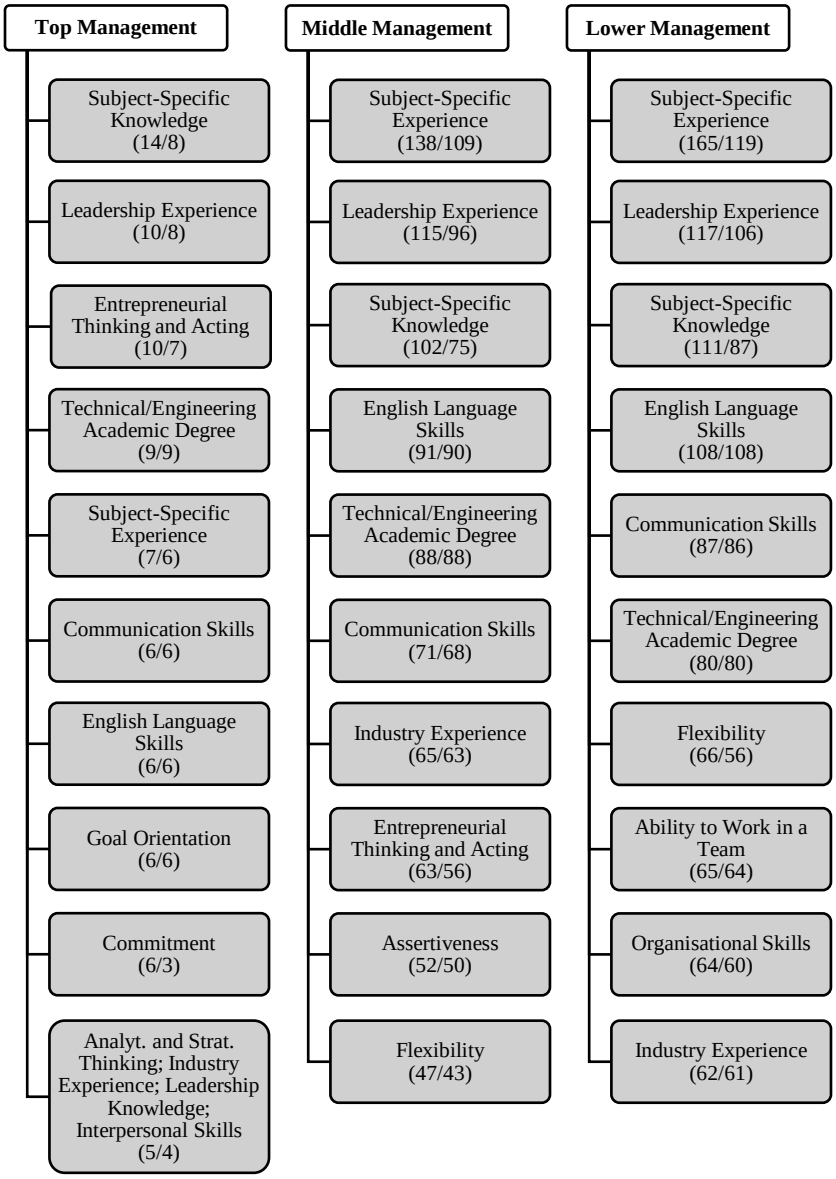

Figure 6: Assignment of Leadership Skills and Traits to Management Levels

Accordingly, certain skills vary between the management levels, such as goal orientation and commitment (top management), assertiveness (middle management), flexibility (middle and lower management), ability to work in a team (lower management) and organisational skills (lower management). Interpreting these differences between management levels as different requirements for top managers might be jumping to conclusions, as it also might be that individual skills

explicitly mentioned for lower and middle management positions are presupposed for top management positions. Furthermore, the sample of job advertisements for top management positions is relatively small. Interestingly, across all management levels, subject-specific knowledge is more frequently demanded than softer factors such as communication skills.

Next, we limit our analysis to skills and traits included in at least 10 % of the job advertisements. Then, in line with our framework, we categorise the skills into technical skills, human skills, conceptual skills, and individual traits (see Table 2)[5].

Technical Skills	Human Skills	Conceptual Skills	Individual Traits	Not Assignable
Language Knowledge (288/207)	Ability to Work in a Team (102/99)	**Communication Skills (164/160)**	**Flexibility (116/102)**	Subject-Specific Experience (310/234)
Subject-Specific Knowledge (227/170)	Assertiveness (98/95)	Entrepreneurial Thinking and Acting (120/104)	Self-Reliance (83/78)	**Leadership Experience (242/210)**
Computer Knowledge (169/110)	Intercultural Competence (47/43)	**Organisational Skills (98/92)**	Goal Orientation (81/75)	Industry Experience (132/128)
Analytical and Strategic Thinking (91/83)	**Ability to Motivate Others (29/29)**		**Motivation (80/72)**	International Experience (49/44)
Presentation Skills (50/46)	Negotiating Skills (30/29)		Commitment (83/71)	
Leadership Knowledge (42/41)			Sense of Responsibility (51/50)	
			Stress Tolerance (34/29)	

In **bold**: Skills and traits identified as relevant in the job advertisement analysis and included in the framework

Table 2: Leadership Skills and Traits Mentioned in at Least 10 % of the Job Advertisement

Noticeably, the majority of skills mentioned falls into the category of technical skills. By comparing the relevant leadership skills identified in the job advertisement analysis with the skills included in our leadership skill framework (see Figure 2), we found only a relatively small overlap. For some skills a classification was not possible, so we include these into the fifth column in Table 2 named "Not Assignable". The construct experience is such an example: It is difficult to assign to one of the categories, as international experience might result, for example, in human skills, such as intercultural competence, and technical or conceptual skills, like knowledge about international

[5] In Table 2 we did not include the constructs *interpersonal skills* and *social skills*, although these were mentioned in more than 10 % of the advertisements. In our opinion, these two constructs are not on the same level as the other skills categorised, but they summarise several skills and thus coincide with the category human skills. Furthermore, we did not include leadership ability in the table since this is also an umbrella term covering several leadership skills.

business systems. We indicate similar aspects[6] in Table 2 using bold letters. The joint aspects include the idea that executives need to be flexible and motivated, but they also need the ability to motivate and develop others. Furthermore, executives need to have communication and organisational skills, computer knowledge[7], and leadership experience. In the job advertisements, analytical and strategic thinking is mentioned frequently, which is similar to meta-cognitive process from the framework, indicating that executives are required to process complex and cumbersome thoughts successfully. Most of the skill constructs presented in Table 2 are not included in the leadership skill framework. Language knowledge and international experience seem to be related to globalisation and digitalisation-related topics such as co-located teams and remote leadership. The skill construct of intercultural competence in the category of human skills completes this picture. In the dimension of individual traits, commitment blends with traits like motivation, which is included in the framework. Other traits like stress tolerance seem to be natural requirements in a complex and changing work environment with many tasks.

To further analyse the skills identified as relevant by the analysis of job advertisements (presented in Table 2), we now compare hard skills and soft skills in Table 3 (see p. 11 for the differentiation).

Hard Skills	Soft Skills	Not Assignable
Language Knowledge (288/207)	**Communication Skills (164/160)**	Subject-Specific Experience (310/234)
Subject-Specific Knowledge (227/170)	Ability to Work in a Team (102/99)	**Leadership Experience (242/210)**
Computer Knowledge (169/110)	Assertiveness (98/95)	Industry Experience (132/128)
Entrepreneurial Thinking and Acting (120/104)	**Organisational Skills (98//92)**	International Experience (49/44)
Analytical and Strategic Thinking (91/83)	Intercultural Competence (47/43)	
Presentation Skills (50/46)	Negotiating Skills (30/29)	
Leadership Knowledge (42/41)	**Ability to Motivate Others (29/29)**	

In **bold**: Skills identified as relevant in the job advertisement analysis and included in the framework

Table 3: Classification of Leadership Skills into Hard Skills and Soft Skills

[6] In Tables 2 and 3, we indicate similar skills in bold, as sometimes a skill is named differently in the literature and in the job advertisements. For example, we identify *computer knowledge* in the job advertisements with *technology skill* in the literature.

[7] Computer knowledge is included in around 40 % of the job advertisements analysed, which suggests that executives today need to be able to handle digital technologies adequately.

Interestingly, a comparison between the total number of codes for hard skills and soft skills reveals that hard skills are demanded more frequently than soft skills. Of the total of 1555 codes, 63% are assigned to hard skills and 37% to soft skills.

6 Discussion

In this paper we identified challenges arising for executives working in an increasingly digitalised work environment and examined which leadership skills and traits are needed. We used a three-step research design comprising the development of a conceptual leadership skill framework, semi-structured interviews with executives, and a systematic analysis of job advertisements for leadership positions.

6.1 Comparison and Discussion of the Results

In the following, we synthesise the results of our study by bringing together the findings from the interview and job advertisements with the conceptual framework. Our framework systematises leadership skills and traits included in the existing literature and allows for a deeper understanding of the relationship between leadership skills and superordinate dimensions.

With regard to the core leadership activities, namely project management, personnel supervision and strategic planning, our framework suggests that strategic planning is primarily a top management activity, while the more operational activities, such as project management and personnel supervision, are done by middle management. The interviews across both top and middle management levels revealed that in our study, the link between management levels and leadership activities is less pronounced. In particular, top management is also engaged in operational activities, while middle management is also involved in strategic planning.

The framework further associates leadership skills with the main leadership activities. As such, project management requires organisational skills, personnel supervision, human skills, and conceptual skills. Our interview participants emphasise the importance of having skills across all skill categories. For example, subject-specific knowledge as a technical skill is required for project management, but so is the human skill self-reflection which, according to our framework, facilitates personnel supervision. Similarly, conceptual skills, i.e. communication and self-organisation take on important positions (i.e. the first and fourth most frequently mentioned leadership skills). Within our framework, these skills are expected to facilitate the top management activity of strategic

planning, but top management executives list these skills less frequently than middle management executives. This is in line with the previous finding that middle management is involved in strategic planning.

Technological developments allow for new forms of work and communication such as immediate exchange of information via various channels at any given time. Therefore, it is crucial for executives to stay informed about new software and technologies so they can evaluate what might bring improvements to their company and enable their teams to implement new tools into their work. This implies that for leaders, communication skills need to be coupled with an increased level of flexibility and adaptability, digital literacy and the ability to organise both physical and virtual working environments. For managing virtual teams and structuring new processes in both physical and virtual workspaces, our research advises that it is not sufficient to have proper communication and organisational skills alone, but that executives also need to be able to motivate employees to implement changes and innovations.

The job advertisement analysis also confirmed the relevance of leadership skills amongst all three categories of our framework. However, amongst the skills and traits most frequently mentioned, there is only a small overlap between the framework and the job advertisements, underlining the importance of considering different sources of information for reaching a comprehensive understanding of leadership skills required in the digital age. Furthermore, based on the job advertisements, we cannot identify definite differences in the requirements for top and middle management positions.

While it is difficult to compare the skill levels of the framework because of the sheer amount of different skills, rearranging the skills into hard and soft skills draws a more condensed picture. Many executives interviewed perceive that soft skills are increasingly important in times of digital change. In the job advertisements, however, subject-specific knowledge is more frequently demanded than soft skills. This raises the question of whether companies are not adapting their job advertisements fast enough to cover the current demands regarding executives' skill sets. Another possible explanation would be that soft skills are difficult to map in job advertisements and are therefore examined at a later stage of the selection process, for example with assessment centres. Furthermore, the job titles of fifteen job advertisements indicated they were advertising a lower management position, but the job descriptions rather described a position in middle management.

This indicates that it is difficult to differentiate between lower and middle management, and, at the same time, it supports the assumption that at least some job advertisements are not used effectively as an instrument for identifying suitable candidates for vacant management positions. However, a more extensive survey of executives is needed to allow for a well-founded matching of job advertisements with current leadership skill requirements.

For some traits identified in the literature, both our interview results and the job advertisement analysis confirm their practical relevance. As such, many interviewees emphasise the importance of empathy, whereas the job profiles point out flexibility and motivation as crucial leadership traits. In addition to that, our interview results indicate that it is important for executives to have calmness in an increasingly fast-paced work environment. This fits well with the need to be able to self-reflect, which, according to our interview results, is also considered among the particularly relevant leadership skills. Self-reflection requires calmness and inner peace to take time to think about one's own actions and behaviour despite a high workload. Calmness as an essential leader trait is not included in our framework, indicating that it might not have been considered a relevant aspect in the existing literature on leadership skills.

Leadership experience constitutes another dimension of our literature-based conceptual framework, overarching different leadership skills. Without exception, the interviewees confirmed the importance of leadership experience. In our analysis of job advertisements, experience ranks as the second most important requirement across all management levels, further underlining its importance. With regard to digitalisation and its successful adaption in management, this poses a challenge, since it is particularly the digital natives who bring technological know-how into firms. In addition to the difficulty of integrating innovations into existing structures, some younger executives interviewed find it challenging to be accepted by their subordinates.

Our study shows that executives are facing digitalisation-related challenges and that certain skills and traits appear to be particularly relevant in this context. With our in-depth analysis of these skills, we provide insights into the peculiarities of digitalisation-related leadership skills, as more sophisticated aspects and changes within these skills have to be considered.

6.2 Limitations and Future Research Directions

Within our framework, we assigned leadership skills discussed in the literature to different dimensions. Although the corresponding assignment is based on the conceptual understanding in

the underlying literature, it remains a subjective concept and requires more empirical evidence. Accordingly, the framework raises no claim to general validity, but tries to connect the versatile findings of the existing literature and to illustrate them vividly. Secondly, our differentiation between the concepts of traits and skills is, on the one hand, rather vague and, on the other hand, for reasons of practicability, deliberately understood as a binary construct. While fluent transitions between the two concepts do exist, a clear separation is not only inevitable for our research, but also for applying these constructs in the practical field with regard to e.g. recruiting decisions, personnel development and the composition of work teams. Hence, there is a need for further research in the area of the differentiation and development of individual skills and traits.

Our final sample size of 21 interviews is adequate for an interview study and in line with other such studies. Still, the relatively small sample of interviewees can be seen as a limitation, making larger-scale studies compulsory to validate the results. Although our industry focus and local constraints allow a better comparison of the results, the transferability of the results to other industries and regions or countries might only be limited. This requires new research insights, so we recommend future studies to further address the impact of digitalisation on leadership-related aspects. For example, the empirical analysis of the present study could be replicated based on other industries and regions or countries to identify possible sectoral or location differences.

6.3 Practical Implications

At the company level, we suggest creating structures that enable young executives with digital know-how to introduce new ideas and implement them in a timely manner. To promote the necessary acceptance of new technologies in the workforce, organisations should encourage collaboration between younger and older executives, for which interfaces in the work processes are needed.

Furthermore, firms should individually re-evaluate what leadership skills should be requested when creating job advertisements for leadership positions at different management levels. Based on what we have learned from the interviews, executives most often have a good feeling of what skills and traits are needed to succeed in their positions. This information should be transferred to the recruiting department in order to bridge a potential gap between what skills candidates need to meet today’s challenges and what skills have traditionally been requested when filling leadership positions.

In line with Phelps (2014), we recommend that both practitioners and educators clarify to firms and candidates what is currently needed regarding leadership skills. Also, universities and other educational institutions are crucial for equipping candidates with what they need to navigate their careers successfully through the digital age and should adapt the curricula properly.

7 Conclusion

In this paper we used a three-stage research design to allow for a comparison of leadership skills discussed in the literature with statements of executives and data extracted from job advertisements for management positions. By merging these sources of information, we provide insights into what challenges executives face in today's digitalised work environment and what skills are particularly relevant in this context, thereby also considering personal traits.

We identified that key challenges for executives include a high level of information diversity, a wide range of business issues, the speed of change, and a high workload. Executives must be able and willing to adapt to an ever-faster changing business environment and to continually review managing practices. This requires empathy, an open-mindedness towards the new, and creative ideas, but also calmness and the ability to reflect on one's own behaviour. Although the majority of interviewed executives consider soft skills to be increasingly important, our results suggest that both soft and hard skills are needed. We identify key leadership skills to be communication skills, language knowledge (especially English), organisational skills, subject-specific knowledge (particularly IT skills), and self-reflection. With an in-depth analysis, we further show concrete aspects within these skills that are relevant in the context of increasing digitalisation.

The main contribution of this paper, however, is not only the list of skills and traits identified but the exploratory design which enabled us to fill concepts with meaning and more context. This illustrates, for example, differences between communication skills in the previous versus the now digitalised working environment. The interpretations are supported by exemplary quotes in the results section of the paper. Furthermore, we identify empathy, an open-mindedness toward the new, flexibility, motivation, and stress tolerance as particularly relevant personal traits in the digital age.

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Appendix

Source	Leadership Skills and Traits	
Marshall-Mies et al (2000)	• Metacognitive Process	Not Concerning Digitalisation
Gartzia and Baniandrés (2016)	• Task Orientation	
Lord and Hall (2005)	• Social Expertise • Self-Monitoring • Emotional Regulation Skills • Emotional Empathy • Capacity to Develop Others	
Goleman (2004)	• Self-Awareness • Empathy	
Goleman (2004); Lord and Hall (2005)	• Self-Regulation	
Riggio and Reichard (2008)	• Emotional Control • Social Control • Emotional Expressiveness • Social Expressiveness • Social Sensitivity • Emotional Sensitivity	
Zaccaro et al (1991) Mumford et al (2000b)	• Social Perceptiveness	
Gartzia and Baniandrés (2016)	• People Orientation	
Marshall-Mies et al (2000) Mumford et al (2000a) Mumford et al (2000b)	• Social Judgment Skills	
Khan and Ahmad (2012)	• Ability to Build Teams	
Mumford et al (2017)	• Problem Definition • Cause/Goal Analysis • Constraint Analysis • Planning Skills • Forecasting Skills • Idea Evaluation • Wisdom • Sensemaking/Visioning	
Marshall-Mies et al (2000) Lord and Hall (2005) Mumford et al (2000a) Mumford et al (2000b)	• Problem Solving Skills	
Marshall-Mies et al (2000) Mumford et al (2000a)	• Solution Construction Skills	
Marshall-Mies et al (2000)	• Planning and Implementation Skills • Solution Evaluation Skills	
Nelson et al (2010)	• Adaptability	
Mumford et al (2017) Mumford et al (2000b)	• Creative Thinking	
Zaccaro et al (1991) Mumford et al (2000b)	• Behavioural Flexibility	
Lord and Hall (2005)	• Greater Adjustment to Others • Flexibility in Emotional and Motivational Orientations	
Goleman (2004) Khan and Ahmad (2012)	• Motivation	
Tarafdar (2016)	• Becoming Digitally Mindful • Empathy for the Varying Technology Preferences of their Human Co-Workers • Partnering with "Digital Colleagues"	Concerning Digitalisation
Hunt (2015) Kane et al (2019)	• Digital Literacy	
Phelps (2014)	• Technical Skills • Team Building Skills • Organizational Skills • Flexibility and Adaptability	
Phelps (2014) Khan and Ahmad (2012)	• Communication Skills	

Table A.1: Overview of Leadership Skills